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Forest Insect and Disease Management

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BIOLOGICAL
EVALUATION R2-77-5

MOUNTAIN PINE BEETLE

Black Hills of South
Dakota and Wyoming, Black
Hills National Forest and
Surrounding Federal, State
and Private Lands

JUNE 1977



Rocky Mountain Region

U.S. Department of Agriculture Forest Service

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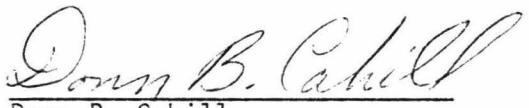
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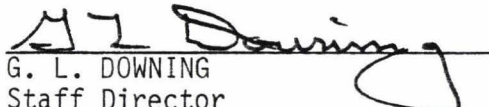
Black Hills of South
Dakota and Wyoming, Black
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and Private Lands

JUNE 1977

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INTRODUCTION

The mountain pine beetle, *Dendroctonus ponderosae* Hopkins, continued to cause extensive ponderosa pine mortality on the Black Hills National Forest and surrounding lands in South Dakota and Wyoming. Losses are especially high in the Limestone area of western South Dakota and eastern Wyoming. Tree mortality was estimated to be 611,000 in 1976.^{1/}

During the week of June 20, 1977, Donn Cahill, Supervisory Entomologist, Jim Allen, Ron MacDonald and Kent Eggleston, Biological Technicians, conducted a mountain pine beetle brood survey to predict the trend of the infestation in 1977. Utilizing Knight's sampling procedure ^{2/} the population trend is predicted.

TECHNICAL INFORMATION

CAUSAL AGENT: Mountain pine beetle, *Dendroctonus ponderosae* Hopkins

HOST: Ponderosa pine, *Pinus ponderosae* Laws.

EXTENT OF INFESTATION: The infestation occurs in over-stocked second-growth stands throughout the Black Hills National Forest and adjacent state, private, and other Federal lands in South Dakota and Wyoming.

^{1/}

CREASAP, V. L. M. and C. D. MINNEMEYER. 1976. Mountain pine beetle, Black Hills of South Dakota and Wyoming, Black Hills National Forest and adjacent State and private lands of South Dakota and Wyoming. Biological Evaluation R2-76-8. 12 pp.

^{2/}

KNIGHT, F. B. 1960. Sequential sampling of Black Hills beetle populations. USDA, Forest Service. Rocky Mtn. For. and Range Exp. Sta. Res. Note #48. 8 p.

LIFE HISTORY: The mountain pine beetle has one generation per year. Adults attack trees from mid-July through early September by boring through the bark to the cambium, then tunnel upward for 12 to 30 inches (these tunnels are called egg galleries). The females lay eggs in individual niches along each side of the gallery which is then packed with frass. After hatching, the larvae feed in individual channels (larval galleries) at right angles to the egg gallery, in the phloem. The insect overwinters in the larval stage. In the spring, when the larvae are fully developed they excavate an oval chamber (called a pupal chamber) at the end of the larval gallery and pupate. Mature adults emerge from these pupal chambers by boring through the outer bark surface and fly to attack new trees completing the generation.

INFESTED TREE SYMPTOMS: Trees that are successfully attacked have the following characteristics:

1. Boring dust is present as a fine, dry frass (sawdust-like) material around the base of the tree and in bark crevices. This characteristic is the best external identification of newly infested trees (early fall).
2. Small (about $\frac{1}{4}$ inch in diameter) pitch tubes may be an external identification of infested trees.
3. Brood of mountain pine beetle is the best internal, and the most positive, evidence of infested trees. The stages of brood would be eggs and larvae in the fall; larvae in the winter; larvae, pupae, and new adults in the spring and early summer.
4. Blue stain (a fungus carried by the beetle) may be visible from late fall in the wood of an infested tree. However, blue stain does not prove the tree is infested by mountain pine beetle. It may also be present in trees infested by Ips or insect abandoned trees.

METHODS

Two 6-by-6-inch bark samples were taken at dbh on opposite sides of currently infested ponderosa pine at 19 locations within the infestation. For each sample, total number of brood by stages of development, inches of egg gallery and number of each species of predators and parasites were tabulated. In addition, at each

sample location, the stand basal area was measured, including infested and uninfested trees, and degree of woodpeckering was also noted. Knight's (1960) sequential sampling plan and William McCambridge's ^{3/} method for predicting tree ratio was used for each sample area.

DISCUSSION AND RESULTS

Seven of the 19 sampled locations (Fig. 1) showed a static trend by using Knight's sequential sampling plan. In using the McCambridge ratio, the build-up of these seven areas would be one new infested (1977) for every currently infested tree at time of sample. The other sample area had an increasing trend with one area (Nickols Creek) indicating a 3 to 1 build-up (see Table 1). The build-up ratio estimates may be lower than the last few years, however, this is still an increasing trend.

The inner bark area (cambium), where brood development occurs, appeared to be much drier this year compared to samples from past year's. An increase of wood borers was also observed in the drier sample trees.

The mountain pine beetle population samples showed an increasing trend for most of the Black Hills, except for the Spearfish Canyon west to the State line area where populations are static.

RECOMMENDATIONS

Continue to reduce the ponderosa pine growing stock level to 80 (basal area is to be 80.0 ft² when average stand diameter is 10.0 inches) in overstocked stands.

Logging infested trees, in conjunction with timber sales to reduce the growing stock level, will utilize beetle-killed timber and will also remove brood material from the infestations.

^{3/} Personal communication

TABLE 1

MOUNTAIN PINE BEETLE BROOD SAMPLE AREA
IN THE BLACK HILLS NATIONAL FOREST

<u>Sample Number</u>	<u>Location</u>	<u>Knight's Trend</u>	<u>McCambridge predicting true ratio.</u>	
			<u>1976</u>	<u>1977</u>
1	Power Creek	Increasing	1	1.5
2	Tent Canyon	Increasing	1	2
3	Pole Cabin Gulch	Static	1	1
4	Upper Little Spearfish	Static	1	1
5	Dead Ox	Static	1	1
6	Merow Spring	Static	1	1
7	Crooks Tower	Increasing	1	2
8	Nichols Creek	Increasing	1	3
9	Slots Spring	Static	1	1
10	Bear Mountain	Increasing	1	1.5
11	Palmer Creek	Increasing	1	2
12	Rapid Creek	Static	1	1
13	Windy Flats	Increasing	1	2
14	Veteran Peak	Increasing	1	1.5
15	Boulder Creek	Increasing	1	1.5
16	Polo Gulch	Increasing	1	1.5
17	Higgins Gulch #1	Static	1	1
18	Fish Hatchery	Static	1	1
19	Higgins Gulch #2	Static	1	1

Fig. 1

Mountain pine beetle brood sampling locations.

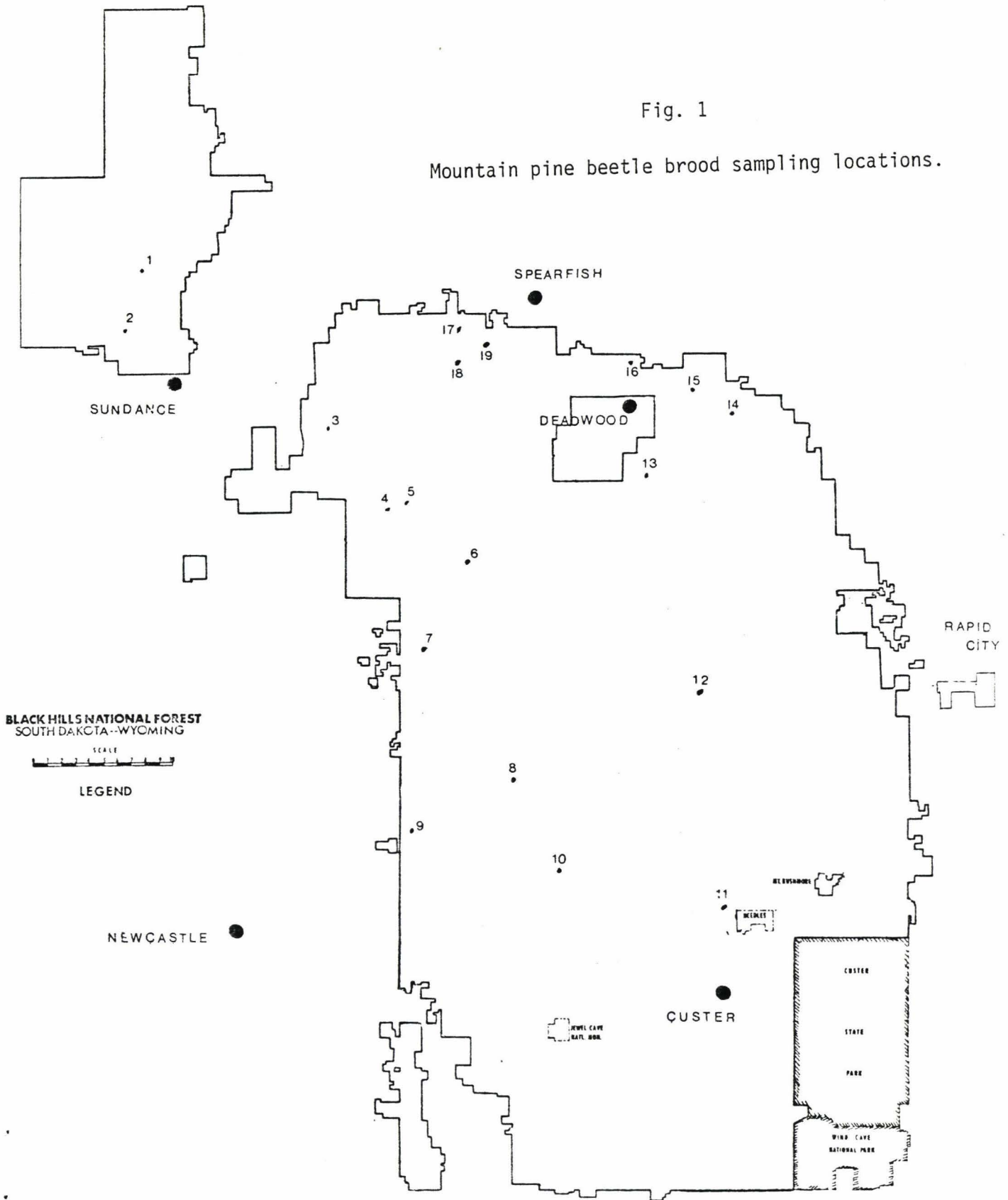


TABLE 2

1977 BLACK HILLS MPB BROOD SURVEY SUMMARY SHEET

AREA	NUMBER TREES	AVERAGE DBH $\pm$ S.E.	NUMBER SAMPLES	TOTAL BROOD	AVERAGE BROOD $\pm$ S.E.	TOTAL STARTS	AVERAGE STARTS $\pm$ S.E.	TOTAL INCHES OF GALLERY	AVERAGE INCHES OF GALLERY $\pm$ S.E.	TOTAL CLERTIDS	TOTAL COELOIDES	TOTAL MEGETERA	BASAL AREA
MOON - CROOKS TOWER													
7. Crooks Tower	10	15.33 $\pm$.52	20	399	19.95 $\pm$ 3.33	62	3.10 $\pm$.16	870	43.5 $\pm$ 1.82	0	0	2	170
8. Nichols Creek	5	20.4 $\pm$.85	10	321	32.10 $\pm$ 6.36	29	2.90 $\pm$.31	412	41.2 $\pm$ 4.22	3	0	26	
9. Slots Spring	10	12.88 $\pm$.91	20	227	11.35 $\pm$ 1.93	48	2.40 $\pm$.18	696	34.8 $\pm$ 2.29	5	1	8	170
TOTAL OR AVERAGE	25	15.36 $\pm$.71	50	947	18.94 $\pm$ 2.23	139	2.78 $\pm$.12	1,978	39.56 $\pm$ 1.52	8	1	36	170
DEADWOOD - STURGIS													
13. Windy Flats	9	11.49 $\pm$.71	18	391	21.72 $\pm$ 3.06	39	2.17 $\pm$.20	520	28.89 $\pm$ 2.41	2	0	16	230
14. Veteran Peak	10	12.13 $\pm$.44	20	321	16.05 $\pm$ 2.44	44	2.20 $\pm$.22	529	26.45 $\pm$ 1.50	4	0	1	140
15. Boulder Creek	12	12.82 $\pm$.77	24	320	13.33 $\pm$ 2.55	44	1.83 $\pm$ 1.8	557	23.21 $\pm$ 1.26	0	0	1	160
16. Polo Gulch	10	10.34 $\pm$.50	20	307	15.35 $\pm$ 2.39	34	1.70 $\pm$.18	491	24.55 $\pm$ 1.37	3	0	5	210
TOTAL OR AVERAGE	41	11.75 $\pm$.34	82	1,335	16.33 $\pm$ 1.32	161	1.96 $\pm$.09	2,097	25.57 $\pm$.83	9	0	23	185
SPEARFISH CREEK & WEST													
3. Pole Cabin Gulch	12	12.44 $\pm$.53	24	208	8.67 $\pm$ 1.47	48	2.00 $\pm$.21	698	29.08 $\pm$ 1.52	0	0	0	150
4. Upper Little Spearfish	5	13.50 $\pm$.98	10	118	11.80 $\pm$ 3.00	29	2.90 $\pm$.48	316	31.60 $\pm$ 2.50	3	0	5	150
5. Dead Ox	5	15.44 $\pm$.73	10	67	6.70 $\pm$ 2.31	25	2.50 $\pm$.32	365	36.50 $\pm$ 4.08	4	1	3	150
6. Menaw Spring	5	11.46 $\pm$.77	10	62	6.20 $\pm$ 2.40	29	2.90 $\pm$.38	305	30.50 $\pm$ 1.92	5	0	0	140
17. Higgins Gulch # 1	5	14.52 $\pm$ 2.04	10	72	7.20 $\pm$ 2.87	35	3.50 $\pm$.54	348	34.80 $\pm$ 3.08	10	0	3	110
18. Fish Hatchery	5	13.78 $\pm$.26	10	63	6.30 $\pm$ 2.21	25	2.50 $\pm$.22	275	27.50 $\pm$ 1.97	11	1	1	110
19. Higgins Gulch #2	5	12.66 $\pm$ 1.64	10	79	7.90 $\pm$ 2.38	31	3.10 $\pm$.23	338	33.80 $\pm$ 2.19	2	0	7	170
TOTAL OR AVERAGE	42	13.24 $\pm$.40	84	669	7.96 $\pm$.82	222	2.64 $\pm$.13	2,645	31.49 $\pm$.93	35	2	19	133
SEARLODGE MOUNTAIN													
1. Power Creek	11	11.83 $\pm$.55	22	325	14.77 $\pm$ 2.52	42	1.91 $\pm$.17	538	24.45 $\pm$ 1.42	1	0	2	150
2. Tent Canyon	8	14.90 $\pm$.89	16	330	20.63 $\pm$ 3.28	41	2.56 $\pm$.29	464	29.00 $\pm$ 1.82	0	0	6	150
TOTAL OR AVERAGE	19	13.12 $\pm$.59	38	655	17.24 $\pm$ 2.04	83	2.18 $\pm$.16	1,002	26.37 $\pm$ 1.17	1	0	8	150
HILL CITY - FACTOLA													
10. Bear Mountain	10	10.47 $\pm$.59	20	272	13.60 $\pm$ 2.64	37	1.85 $\pm$.20	707	35.35 $\pm$ 21.0	0	3	6	120
11. Palmer Creek	10	10.47 $\pm$.64	20	357	17.85 $\pm$ 2.54	49	2.45 $\pm$.18	530	26.50 $\pm$ 1.74	0	0	2	180
12. Rapid Creek	7	9.54 $\pm$.48	14	162	11.57 $\pm$ 3.43	27	1.93 $\pm$.30	291	20.79 $\pm$ 1.46	2	0	9	150
TOTAL OR AVERAGE	27	10.23 $\pm$.40	54	791	14.65 $\pm$ 1.63	113	2.09 $\pm$.13	1,528	28.30 $\pm$ 1.33	2	3	17	157
GRAND TOTAL OR AVERAGE	154	12.65 $\pm$.24	308	4,40	14.29 $\pm$.71	718	2.33 $\pm$.06	9,250	30.03 $\pm$.57	55	6	103	154

+ Figures are one Standard Error